What is claimed is:

1. A radiation source for generating extreme ultraviolet (EUV) radiation, wherein a hot plasma emitting the desired radiation is generated in a vacuum chamber, comprising:

a plasma generation unit which is directly connected with the vacuum chamber for introducing high energy input which is supplied in a pulsed manner in order to generate hot plasma in a small spatial extension and with high density in a vacuum chamber;

said vacuum chamber having an outlet opening for coupling out a light bundle for a specific application;

a vacuum generation unit for generating a diluted gas atmosphere at defined pressure in the vacuum chamber and portions of the plasma generation unit;

said vacuum generation unit furthermore having at least one vacuum pump, a pressure measuring device and a control for maintaining a suitable operating pressure for the generation of the plasma and EUV radiation, and an energy monitor unit for detecting the pulse energy of the emitted radiation;

said energy monitor unit having a feedback to the energy input for regulating a pulse-to-pulse stability of the energy emission of the plasma, a radiation diagnosis unit for analyzing the actual radiation characteristic of the radiation emitted from the plasma and generating result data of the diagnosis for influencing the excitation conditions for the plasma, and a main control unit for controlling a defined quality of the coupled out light bundle as radiation pulses of application-specific pulse repetition rate, average energy emission and radiation intensity;

said main control unit having interfaces to said units of the radiation source in order to detect at least their state of adjustment; and

operator controls being provided for application-specific control in order to influence the radiation source depending upon transmitted status data, diagnosis data and application requirements that are entered.

2. The radiation source according to claim 1, wherein the energy monitor unit (4) has a detector for determining the EUV pulse energy for every individual pulse.

3. The radiation source according to claim 2, wherein the energy monitor unit has

a second detector for determining the absolute EUV pulse energy which is illuminated only occasionally for comparison measurements in relation to the emitted radiation and for calibrating the first detector.

4. The radiation source according to claim 1, wherein the radiation diagnosis unit as a spectrograph for determining the spectral distribution of the emitted radiation.

5. The radiation source according to claim 4, wherein the spectrograph contains a calibrated detector for determining the output energy or power of the EUV radiation source.

6. The radiation source according to claim 1, wherein the radiation diagnosis unit has a plurality of sensors of different spectral sensitivity, the light yield being measured in defined spectral intervals.

7. The radiation source according to claim 6, wherein the radiation diagnosis unit has a plurality of sensors with different filters, wherein the light yield can be measured in defined spectral intervals by differentiation of measured intensity values of different sensors.

8. The radiation source according to claim 7, wherein the radiation diagnosis unit has means for comparing the measured radiation components within the desired EUV spectral region and outside this range, wherein the quality of the plasma can be analyzed and adjustment variables for the plasma generation unit can be derived by comparing the intensity values of individual spectral intervals to one another.

9. The radiation source according to claim 1, wherein the radiation diagnosis unit has an EUV-sensitive camera for determining the size and position of the source location of the radiation in the plasma.

10. The radiation source according to claim 9, wherein the radiation diagnosis unit contains an imaging optical system, preferably a reflecting multilayer mirror system, for

determining the angular distribution of the EUV radiation which is generated by the plasma and exits from the vacuum chamber.

11. The radiation source according to claim 1, wherein the radiation diagnosis unit has a fast EUV detector with response times of a few nanoseconds or less for determining the pulse shape of the emitted radiation.

12. The radiation source according to claim 11, wherein at least one additional fast EUV detector is provided for purposes of recalibrating the first fast EUV detector.

13. The radiation source according to claim 1, wherein the plasma generation unit contains a high-voltage module for generating a high voltage for gas discharge and a discharge module with electrodes that are suitably shaped for a through-flow of gas, wherein a pulsed application of voltage to the electrodes is provided as energy input for plasma generation, and has a gas supply module for the flow of gas through the electrodes which provides a work gas in the vacuum chamber in a suitable composition for plasma generation.

14. The radiation source according to claim 13, wherein the high-voltage module has a capacitor bank which can be charged in a small amount of time and discharged by means of a switching element and an electric circuit via the electrodes of the discharge module.

15. The radiation source according to claim 14, wherein magnetic compression stages for reducing current rise times and additional capacitor banks are integrated in the high-voltage module.

16. The radiation source according to claim 13, wherein the high-voltage module communicates with the main control unit with respect to voltage and charging speed, wherein a triggering of the high-voltage module, particularly the switching element, is provided for determining the time of discharge by means of an external signal of the main control unit.

17. The radiation source according to claim 13, wherein a gas recycling module which is connected to the vacuum generation unit for receiving and delivering gas pumped out of the vacuum chamber communicates with the gas supply module.

18. The radiation source according to claim 13, wherein the discharge module has two concentrically arranged electrodes which are separated from one another by an insulator disk for a plasma focus discharge.

19. The radiation source according to claim 13, wherein the discharge module has two oppositely located electrodes for a Z-pinch discharge which are separated by an insulator tube.

20. The radiation source according to claim 19, wherein the discharge module has a Z-pinch construction which is modified for a capillary discharge, wherein the inner diameter of the insulator tube is very small.

21. The radiation source according to claim 13, wherein the discharge module contains two oppositely located electrodes, wherein the cathode has a cavity in which the plasma ignition takes place for hollow cathode triggered pinch discharge.

22. The radiation source according to claim 1, wherein the plasma generation unit has a laser module by which the plasma is generated by laser bombardment of a target in the vacuum chamber, wherein the laser module is outfitted with control components for self-regulation of the laser based on a laser beam diagnosis, and has a controllable target generator module which is provided for generating a target flow for the laser bombardment that is defined with respect to aggregate state, temperature and shape.

23. The radiation source according to claim 22, wherein a radiation diagnosis module which contains a device for measuring the output energy and pulse energy of the laser beam is associated with the laser module.

24. The radiation source according to claim 22, wherein a focusing device for the laser beam, particularly an autofocus device, is associated with the laser module.

25. The radiation source according to claim 22, wherein collector optics for bundling the radiation emitted from the plasma are arranged in the vacuum chamber, wherein the collector optics comprise a curved multilayer mirror and are arranged in such a way that the usable intensity of the light bundle exiting from the outlet window is increased.

26. The radiation source according to claim 1, wherein a debris filter unit is provided for absorption of particles that are emitted from the plasma with the desired radiation, wherein the debris filter is arranged between the plasma and optical elements of collector optics which are provided for shaping and bundling the radiation exiting from the outlet opening of the vacuum chamber.

27. The radiation source according to claim 22, wherein the vacuum generation unit is incorporated in a target recycling module, wherein a collecting device for target residues which are sucked out via compressors is arranged in the vacuum chamber opposite the target generator module and the outputs of the compressors and vacuum generation unit are connected to the target generator module.

28. The radiation source according to claim 1, wherein the vacuum generation unit has a link to the main control unit by which an adjustment of the required pressure is provided for the plasma generation in the vacuum chamber.

29. The radiation source according to claim 1, wherein the main control unit contains all controls and regulation for all units and modules, wherein corresponding data interfaces are provided for transferring measurement values and adjusting values in order to monitor all functions and states of the radiation source and control them in a coordinated manner.

30. The radiation source according to claim 1, wherein the main control unit provides only application-oriented control functions for the units and modules of the radiation

source and has means for monitoring damage and disturbance, wherein all units and modules contain their own control systems and regulation systems which have data communication with the main control unit.